

## Claims

1. An integrated injection-pumping fixture for hydronic heating systems, for providing an injection loop for transferring heat from a higher-temperature loop to a lower-temperature loop, the fixture comprising:

- 5        an integrated casting;  
      higher-temperature supply and return ports formed in the integrated casting;  
      lower-temperature supply and return ports formed in the integrated casting;  
      an injection pump volute formed in the integrated casting and configured to accept an impeller of an injection pump; and  
10        a lower-temperature loop pump volute formed in the integrated casting and configured to accept an impeller of a lower-temperature loop pump,  
      wherein liquid from the higher-temperature loop enters the integrated casting through the higher-temperature supply port, mixes with liquid circulating in the lower-temperature loop, and leaves the integrated casting through the higher-temperature return  
15        port, and  
      wherein liquid circulating in the lower-temperature loop enters the integrated casting through the lower-temperature return port, mixes with liquid entering from the higher-temperature loop, and leaves the integrated casting through the lower-temperature supply port.

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2. The fixture of claim 1 further comprising a check valve in the higher-temperature supply port or higher-temperature return port.

3. The fixture of claim 1 wherein the integrated pumping fixture is for a radiant  
25        heating system, and the higher-temperature loop is a boiler loop, and the lower-temperature loop is a radiant loop.

4. The fixture of claim 3 wherein the integrated casting has a mixing chamber formed therein, and the integrated casting is configured so that the mixing chamber  
30        receives liquid entering the integrated casting through the radiant loop return port and

through the boiler supply port, and so that the injection pump and the radiant loop pump each draw liquid from the mixing chamber.

5           5. The fixture of claim 3 wherein the mixing chamber is configured to serve as an air elimination chamber with a vent at the top end.

6. The fixture of claim 3 further comprising a check valve in the path followed by liquid traveling from the boiler supply port to the injection pump, or in the path from the injection pump to the boiler return port.

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7. The fixture of claim 6 wherein the check valve is incorporated into a passage through which liquid flows from the boiler supply port to the mixing chamber, thereby stopping flow from the radiant return from entering the boiler supply.

15           8. The fixture of claim 3 wherein the radiant loop supply and return ports are located so that the ports are spaced apart by a distance approximating the spacing of the radiant supply and return ports on radiant heat flow manifolds.

9. The fixture of claim 3 wherein the integrated casting is a single casting.

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10. The fixture of claim 3 wherein the integrated casting comprises a plurality of castings joined together by close-fitting, mating connections sealed with O-ring type seals.